

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/531,160
Cnfrm. No. : 4722
Applicant : Boris Shekunov et al.
Filed : April 12, 2005
Title : NANOPARTICLES FROM SUPERCRITICAL FLUID
: ANTISOLVENT PROCESS USING PARTICLE GROWTH AND
: AGGLOMERATION RETARDANTS

TC/A.U. : 1618
Examiner : Nabila G. Ebrahim

Docket No. : FER-14857.001.001

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is being filed in accordance with 37 C.F.R. §41.37 within two months of the Notice of Appeal, which was filed in this matter on September 15, 2006.

I. REAL PARTY IN INTEREST

The real party in interest or owner of the present application and the technology and inventions embodied therein is Ferro Corporation, whose principal mailing address is 1000 Lakeside Avenue, Cleveland, Ohio 44114. An assignment transferring rights from the inventors to Ferro Corporation was recorded on April 12, 2005 at Reel 017179, Frame 0141.

II. RELATED APPEALS AND INTERFERENCES

The application is not involved in an interference proceeding and there are no related appeals.

III. STATUS OF CLAIMS

The application was filed on April 12, 2005 with 21 claims. On March 31, 2006, the Examiner issued a first Office Action in which all 21 claims were rejected on various grounds. On April 18, 2006, applicants filed an Amendment, amending three of the original claims. On June 29, 2006, the Examiner issued a second Office Action in which the rejection of all 21 claims was repeated and made final.

The pending claims are set forth in the Claims Appendix, which is attached hereto for the convenience of the Board.

IV. STATUS OF AMENDMENTS

No amendments were filed in the application subsequent to the final rejection mailed June 29, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As described in the application on page 3, lines 21-28 (paras. [0013]-[0014]), the present invention provides a method of forming particles using supercritical fluid ("SCF") that employs one or more compounds that are soluble in SCF and act as particle growth and agglomeration inhibitors during precipitation. In all processes in which SCF is used to precipitate particles, the particles are formed via supersaturation, which in turn leads to the formation of nuclei. Particles are obtained when the nuclei formed coalesce together to form large, stable entities. In the method of the present invention, one or more SCF soluble compounds, which are referred to in the application as "growth retardant compounds", are employed to hinder nuclei coalescence, which results in the precipitation of smaller particles. Apart from affecting nuclei coalescence, the growth retardants also hinder inter particle interaction and thus minimize particle agglomeration.

The application discloses three embodiments of the method of the invention, and each of the three embodiments is separately claimed in an independent claim. Independent claim 1 claims the first embodiment of the method of the invention, which is described on page 6, lines 7-10 (para. [0024]), from page 10, line 27 to page 12, line 13 (paras. [0039]-[0043]) and with reference to Fig. 1. In the first embodiment of the method of the invention, a solution comprising a solvent, a solute material to be precipitated and a growth retardant compound are pumped into contact with a supercritical fluid (see spec. at p. 11, lines 2-6 (para. [0039])). As soon as the solution contacts the SCF, mass transfer of the solvent in the solution into the SCF results in

supersaturation and nucleation of the solute material (see spec. at p. 11, lines 12-14 (para. [0041])). The particles of solute material have a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present (see spec. at p. 11, lines 14-22 (para. [0041])).

Independent claim 8 claims the second embodiment of the method of the invention, which is described from page 5, line 28, to page 6, line 6 (para. [0024]), from page 12, line 14 to page 13, line 27 (paras. [0044]-[0048] and with reference to Fig. 2. The second embodiment of the method of the invention differs from the first embodiment in that the growth retardant compound is mixed with the SCF prior to supersaturation, rather than being present as a component of the solution (see spec. at p. 12, line 29, to page 13, line 2 (para. [0045])).

And, independent claim 15 claims the third embodiment of the method of the invention, which is described on page 6, lines 11-24 (para. [0025]), from page 13, line 28 to page 15, line 28 (paras. [0049]-[0053]) and with reference to Fig. 3. The third embodiment of the method of the invention differs from the first two embodiments of the method of the invention in that both the solute material to be precipitated and the growth retardant compound are pre-dissolved into the SCF, and then are co-injected across a pressure drop whereupon particle precipitation occurs due to rapid expansion of the SCF (see spec. at p. 14, lines 19-27 (paras. [0050]-[0051])).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-3, 5-10, 12-17 and 19-21 were properly rejected under 35 U.S.C. §102(b) as being anticipated by Subramaniam et al., U.S. Pat. No. 5,874,029; and

Whether claims 1-21 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Subramaniam et al. in view Tarara et al., Pub. No. US 2003/0064029 A1.

VII. ARGUMENT

A. *Claims 1-3 and 5-7 (Grouped) Were Improperly Rejected Under 35 U.S.C. §102*

The Examiner rejected claims 1-3 and 5-7 under 35 U.S.C. §102(b) as being anticipated by Subramaniam et al. For the reasons set forth below, applicants respectfully submit that the Examiner's rejection of such claims was improper, and should be reversed.

Claim 1 of the present application claims (bold, italicized emphasis added):

A method of producing particles using supercritical fluid (SCF) comprising:
providing a source of SCF;
providing a solution comprising:
at least one solvent that is at least partially soluble in the SCF;
at least one solute material that is at least partially soluble in the solvent and substantially insoluble in the SCF; and
at least one growth retardant compound that is at least partially soluble in the SCF and includes at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic; and
contacting the solution and the SCF together under conditions whereby the solvent diffuses into the SCF causing supersaturation and nucleation of particles comprising the solute material, said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

Like the present application, Subramaniam et al. is directed to a method for producing particles using SCF. However, the methods are significantly different. In accordance with the teachings of Subramaniam et al., a solution comprising a solvent and a dissolved solute material is sprayed out of a nozzle in the form of atomized droplets into a supercritical antisolvent ("SAS"), which causes depletion of the solvent in the atomized droplets of solution and recrystallization of the solute in the form of particles. The difference between the method according to Subramaniam et al. and conventional SAS processes is that Subramaniam et al. teaches that the solution should be introduced into the nozzle together with an "energizing gas" (which Subramaniam et al. also refers to as a "compressed fluid" or "compressed gas" - see col. 8, lines 9-10) that exits the nozzle at a velocity such that the spray of solution is "shattered into extremely small droplets at the nozzle exit" (col. 6, lines 1-8). Subramaniam et al. teaches that "[c]ontact between the extremely small spray droplets and a turbulent stream of virtually pure antisolvent results in high solvent depletion rates, i.e. high mass transfer rates, and low

probability for droplet coalescence" (col. 6, lines 13-18).

In contrast to the method and apparatus according to Subramaniam et al., the invention as claimed in claim 1 requires that a growth retardant compound that is at least partially soluble in the SCF and includes at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic to be present in the solution that is sprayed into the SCF antisolvent. The growth retardant compound protects or shields the developing particle nuclei precipitated upon depletion of the solvent thereby preventing the particles from agglomerating into larger particles. Applicants' claimed method of producing particles is thus a chemical mechanism as opposed to a physical mechanism such as disclosed in Subramaniam et al.

Subramaniam et al. does not ever disclose, teach or suggest that the solution that is sprayed into the SCF antisolvent further comprise a growth retardant compound that is at least partially soluble in the SCF and includes at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic. The Examiner attempts to overcome this deficiency by arguing that since applicants describe fluorocarbons as potential growth retardant compounds, the mere mention of the word "trifluoromethane" (which is a "fluorocarbon") in Subramaniam et al. is sufficient to anticipate applicants' invention. Clearly, this is not the case.

Subramaniam et al. mentions trifluoromethane, but only in the context of trifluoromethane ("CHF₃") being used as an SCF anti-solvent into which the solution comprising the solute and solvent is sprayed (see col. 16, line 37 and claim 12). Thus, Subramaniam et al. clearly does not teach the use of trifluoromethane or any other fluorocarbon as a growth retardant compound that is present in a solution that is sprayed into a SCF antisolvent as claimed in claim 1. Subramaniam et al. teaches trifluoromethane as a SCF antisolvent.

In the prior Office Action, in response to applicants' arguments, the Examiner did not address this clear distinction. The Examiner simply stated that (see page 8):

A compound and its properties are not separable; the prior art clearly includes a fluorocarbon in a similar process. It is not necessary that the prior art recognizes each and every advantage that a compound can accrue from the use of the particular compound. It is expected that the compound will achieve the retardant purpose intended by the instant application.

This contention is not supported by the law, nor by the teachings of the applied prior art. Both Subramaniam et al. and the present applicants recognized that in prior art SAS processes,

the mass transfer rate of the solvent from the solution to the SCF caused particles to be larger than desired and to agglomerate. Subramaniam et al. solved this problem by introducing the solution of solute and solvent into the SCF antisolvent together with a compressed gas, which shatters the solution into smaller discrete spray drops, where they are separated before mass transfer of the solvent into the SCF antisolvent takes place. Applicants, on the other hand, invented a different method of solving the problem, namely, adding a growth retardant compound to the solution that inhibits the growth and agglomeration of the solute particles when the solution is contacted with the SCF. Applicant's method as claimed in claim 1 is completely different than the method disclosed in Subramaniam et al.

Claims 2, 3 and 5-7 depend from claim 1 directly or through an intervening claim and are thus not anticipated by Subramaniam et al. for the same reasons that claim 1 is not anticipated by Subramaniam et al.

B. Claims 8-10 and 12-14 (Grouped) Were Improperly Rejected Under 35 U.S.C. §102

The Examiner also rejected claims 8-10 and 12-14 under 35 U.S.C. §102(b) as being anticipated by Subramaniam et al. For the reasons set forth below, applicants respectfully submit that the Examiner's rejection of such claims was improper, and should be reversed.

Claim 8 of the present application claims (bold, italicized emphasis added):

A method of producing particles using supercritical fluid (SCF) comprising:
providing a source of SCF;
providing a solution comprising:
at least one solvent that is at least partially soluble in the SCF;
and
at least one solute material that is at least partially soluble in the solvent and substantially insoluble in the SCF;
dissolving at least one growth retardant compound in the SCF, the growth retardant compound including at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic;
and
contacting the solution and the SCF comprising the dissolved growth retardant compound together under conditions whereby the solvent diffuses into the SCF causing supersaturation and nucleation of particles comprising the solute material, said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

As noted above, Subramaniam et al. is directed to a method for producing particles using SCF as an antisolvent. Subramaniam et al. does not teach that a growth retardant compound should be dissolved into the SCF antisolvent before a solution comprising a solute dissolved in a solvent is sprayed into the SCF antisolvent. That teaching is only disclosed in the present application.

Also as noted above, Subramaniam et al. does mention trifluoromethane, which is a fluorocarbon, but only in the context of trifluoromethane being used as an SCF anti-solvent into which the solution comprising the solute and solvent is sprayed (together with a compressed gas). Thus, there is no teaching in Subramaniam et al. of a method step that comprises dissolving at least one growth retardant compound in the SCF, the growth retardant compound including at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic as claimed in claim 8. In all instances, Subramaniam et al. contemplate that the SCF antisolvent comprises a single constituent, which makes sense since Subramaniam et al. overcome the problem associated with rapid mass transfer of the solvent from the solution into the SCF antisolvent by shattering the solvent into small droplets through the use of a compressed gas (and not using a growth retarding compound dissolved in the SCF antisolvent as claimed in claim 8). Reconsideration of the rejection of claim 8 is respectfully requested.

Claims 9, 10 and 12-14 depend from claim 8 directly or through an intervening claim and are thus not anticipated by Subramaniam et al. for the same reasons that claim 8 is not anticipated by Subramaniam et al.

C. Claims 15-17 and 19-21 (Grouped) Were Improperly Rejected Under 35 U.S.C. §102

The Examiner also rejected claims 15-17 and 19-21 under 35 U.S.C. §102(b) as being anticipated by Subramaniam et al. For the reasons set forth below, applicants respectfully submit that the Examiner's rejection of such claims was improper, and should be reversed.

Claim 15 of the present application claims (bold, italicized emphasis added):

A method of producing particles using supercritical fluid (SCF) comprising:
providing a source of SCF;
dissolving at least one solute material and at least one growth retardant compound in the SCF to form an SCF solution, wherein the growth retardant compound includes at least one

***functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic; and
expanding SCF solution across a pressure drop below the critical pressure of the SCF whereby the SCF decompresses and causes supersaturation and nucleation of particles comprising the solute material,*** said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

As noted above, Subramaniam et al. is directed to a method for producing particles using SCF as an antisolvent. Subramaniam et al. does not teach that a solute material and a growth retardant compound should be dissolved into the SCF antisolvent to form an SCF solution, and that the SCF solution should be expanded across a pressure drop to cause supersaturation and nucleation of the particles comprising the solute material. That teaching is only disclosed in the present application.

In the prior Office Action, the Examiner contends that "Subramaniam [et al.] discloses that following the drying period, the pressure is decreased to atmospheric level (col. 9, lines 11-24)." This is certainly true. But it does not teach applicants' method as claimed in claim 15. Applicants' method as claimed requires that an SCF solution comprising at least one solute material and at least one growth retardant compound in the SCF be expanded across a pressure drop below the critical pressure of the SCF whereby the SCF decompresses and causes supersaturation and nucleation of particles comprising the solute material. In Subramaniam et al., no SCF solution is ever formed that could be expanded to cause supersaturation and nucleation of particles because the solvent is depleted from the solution sprayed into the SCF antisolvent together with the atomizing compressed gas. When the collection vessel according to Subramaniam et al. is depressurized, the particles have long been formed and dried, and the solvent has been removed. The methods are completely different.

Claims 16, 19 and 19-21 depend from claim 15 directly or through an intervening claim and are thus not anticipated by Subramaniam et al. for the same reasons that claim 15 is not anticipated by Subramaniam et al.

D. Claims 1-7 (Grouped) Were Improperly Rejected Under 35 U.S.C. §103

Also in the prior Office Action, the Examiner rejected claims 1-7 under 35 U.S.C. §103(a) as being unpatentable over Subramaniam et al. in view of Tarara et al. The Examiner concedes that Subramaniam et al. is deficient in disclosing that the growth retardant compound in the solution that is sprayed into the SCF antisolvent can be a sugar acetate, fluorocarbon or a block polymer. This is certainly true. As noted above, Subramaniam et al. is deficient in teaching the use of any growth retardant compounds of any kind in a solution that is sprayed into an SCF antisolvent. Subramaniam et al. achieves small particle size in a SAS process through the use of an "energizing gas" that physically creates an ultrasonic or near-sonic wave front at the nozzle tip that breaks an atomized spray of solution into small particles. Subramaniam et al. does not achieve small particle size through the use of chemical growth retardant compounds of any type.

Tarara et al. cannot be relied upon to overcome the deficiencies in the teachings of Subramaniam et al. as applied to the present claims. Tarara et al. is directed to the formation of "perforated microstructures" that can be used for inhaled drug therapy. The "perforated microstructures" according to Tarara et al. are formed via a spray drying process that employs a "blowing agent" and uses "commercially available equipment" (paragraph [0025]). Tarara et al. teaches that in some applications it is desirable to retain high amounts of the "blowing agent" in the spray-dried product (see paragraphs [0087] and [0088]). In order to retain the "blowing agent" in the "perforated microstructures", Tarara et al. teaches that the outlet temperature of the spray drying device should be about 20°C to about 150°C below the boiling point of the "blowing agent" (see paragraph [0088]). It is in this context that Tarara et al. mentions that "[i]n some cases, the temperature differential can be outside this range such as, for example, when producing the particulates under supercritical conditions or using lyophilization techniques" (paragraph [0088]). This is the only instance in Tarara et al. where the word "supercritical" is mentioned. It is inconceivable how one of ordinary skill in the art, in view of Tarara et al. taken as a whole, would be motivated to modify the process according to Subramaniam et al. to incorporate a growth retardant compound such that it is present in the solution that is sprayed into the SCF, as claimed in claim 1. The processes and mechanisms are completely different, and there is no reason one would be motivated to do that which the Examiner contends is obvious.

Claims 2-7 depend from claim 1 either directly or through an intervening claim and are thus patentable over Subramaniam et al. and Tarara et al. for the same reasons that claim 1 is patentable over such references.

E. Claims 8-14 (Grouped) Were Improperly Rejected Under 35 U.S.C. §103

Also in the prior Office Action, the Examiner rejected claims 8-14 under 35 U.S.C. §103(a) as being unpatentable over Subramaniam et al. in view of Tarara et al. The Examiner concedes that Subramaniam et al. is deficient in disclosing that the growth retardant compound dissolved in the SCF into which the solution (solvent and solute) is sprayed can be a sugar acetate, fluorocarbon or a block polymer. This is certainly true. As noted above, Subramaniam et al. is deficient in teaching the use of any growth retardant compounds of any kind in a SCF antisolvent into which a solution comprising a solvent and a solute is sprayed. Subramaniam et al. achieves small particle size in a SAS process through the use of an "energizing gas" that physically creates an ultrasonic or near-sonic wave front at the nozzle tip that breaks an atomized spray of solution into small particles. Subramaniam et al. does not achieve small particle size through the use of chemical growth retardant compounds of any type.

Tarara et al. cannot be relied upon to overcome the deficiencies in the teachings of Subramaniam et al. as applied to the present claims. Tarara et al. is directed to the formation of "perforated microstructures" via a spray drying process that employs a "blowing agent" and uses "commercially available equipment" (paragraph [0025]). It is inconceivable how one of ordinary skill in the art, in view of Tarara et al. taken as a whole, would be motivated to modify the process according to Subramaniam et al. to incorporate a growth retardant compound into the SCF antisolvent into which a solution comprising a solvent and a solute is sprayed, as claimed in claim 8. The processes and mechanisms are completely different, and there is no reason one would be motivated to do that which the Examiner contends is obvious.

Claims 9-14 depend from claim 8 either directly or through an intervening claim and are thus patentable over Subramaniam et al. and Tarara et al. for the same reasons that claim 8 is patentable over such references.

F. Claims 15-21 (Grouped) Were Improperly Rejected Under 35 U.S.C. §103

Also in the prior Office Action, the Examiner rejected claims 15-21 under 35 U.S.C. §103(a) as being unpatentable over Subramaniam et al. in view of Tarara et al. The Examiner concedes that Subramaniam et al. is deficient in disclosing that the growth retardant compound dissolved in the SCF together with the solute can be a sugar acetate, fluorocarbon or a block polymer. This is certainly true. As noted above, Subramaniam et al. is deficient in teaching the use of any growth retardant compounds of any kind in a SCF antisolvent into which a solute is dissolved and subsequently expanded across a pressure drop. Subramaniam et al. achieves small particle size in a SAS process through the use of an "energizing gas" that physically creates an ultrasonic or near-sonic wave front at the nozzle tip that breaks an atomized spray of solution into small particles. Subramaniam et al. does not achieve small particle size through the use of chemical growth retardant compounds of any type.

Tarara et al. cannot be relied upon to overcome the deficiencies in the teachings of Subramaniam et al. as applied to the present claims. Tarara et al. is directed to the formation of "perforated microstructures" via a spray drying process that employs a "blowing agent" and uses "commercially available equipment" (paragraph [0025]). It is inconceivable how one of ordinary skill in the art, in view of Tarara et al. taken as a whole, would be motivated to modify the process according to Subramaniam et al. to incorporate a growth retardant compound into the SCF together with the solute to form an SCF solution that is subsequently expanded across a pressure drop, as claimed in claim 15. The processes and mechanisms are completely different, and there is no reason one would be motivated to do that which the Examiner contends is obvious.

Claims 16-21 depend from claim 15 either directly or through an intervening claim and are thus patentable over Subramaniam et al. and Tarara et al. for the same reasons that claim 15 is patentable over such references.

Conclusion

In view of the foregoing, it is respectfully submitted that claims 1-21 are allowable over the prior art references of record, and a ruling from the Board to that effect is therefore respectfully requested.

Respectfully submitted,
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CLAIMS APPENDIX

Claim 1 (original): A method of producing particles using supercritical fluid (SCF) comprising:

- providing a source of SCF;

- providing a solution comprising:

 - at least one solvent that is at least partially soluble in the SCF;

 - at least one solute material that is at least partially soluble in the solvent and substantially insoluble in the SCF; and

 - at least one growth retardant compound that is at least partially soluble in the SCF and includes at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic; and

- contacting the solution and the SCF together under conditions whereby the solvent diffuses into the SCF causing supersaturation and nucleation of particles comprising the solute material, said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

Claim 2 (original): The method according to claim 1 wherein the SCF is supercritical carbon dioxide.

Claim 3 (original): The method according to claim 2 wherein the growth retardant compound is selected from the group consisting of sugar acetates, fluorocarbons and block copolymers.

Claim 4 (previously presented): The method according to claim 2 wherein the block copolymer is comprised of polymer blocks selected from the group consisting of polypropylene oxide, poly methacrylic acid (PMMA), poly acrylic acid (PAA), poly vinyl acetate (PVA) and polyethylene oxide (PEO).

Claim 5 (original): The method according to claim 1 wherein the solute material is selected from the group consisting of medicinal agents, biologically active materials, sugars,

viral materials, diagnostic aids, nutritional materials, proteins, peptides, animal extracts, plant extracts and combinations thereof.

Claim 6 (original): The method according to claim 5 wherein the solution further comprises a second solute material selected from the group consisting of polymers, fillers, disintegrants, binders, solubilizers, excipients, and combinations thereof. In particular, the matrix materials can be, for example, polysaccharides, polyesters, polyethers, polyanhydrides, polyglycolides (PLGA), polylactic acids (PLA), polycaprolactones (PCL), polyethylene glycols (PEG), polypeptides and combinations thereof.

Claim 7 (original): The method according to claim 6 wherein the particles have an average particle size of less than 10 micron and more than 300 nm.

Claim 8 (original): A method of producing particles using supercritical fluid (SCF) comprising:

- providing a source of SCF;

- providing a solution comprising:

- at least one solvent that is at least partially soluble in the SCF; and

- at least one solute material that is at least partially soluble in the solvent and substantially insoluble in the SCF;

- dissolving at least one growth retardant compound in the SCF, the growth retardant compound including at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic; and

- contacting the solution and the SCF comprising the dissolved growth retardant compound together under conditions whereby the solvent diffuses into the SCF causing supersaturation and nucleation of particles comprising the solute material, said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

Claim 9 (original): The method according to claim 8 wherein the SCF is supercritical carbon dioxide.

Claim 10 (original): The method according to claim 9 wherein the growth retardant compound is selected from the group consisting of sugar acetates, fluorocarbons and block copolymers.

Claim 11 (previously presented): The method according to claim 10 wherein the block copolymer is comprised of polymer blocks selected from the group consisting of polypropylene oxide, poly methacrylic acid (PMMA), poly acrylic acid (PAA), poly vinyl acetate (PVA) and polyethylene oxide (PEO).

Claim 12 (original): The method according to claim 8 wherein the solute material is selected from the group consisting of medicinal agents, biologically active materials, sugars, viral materials, diagnostic aids, nutritional materials, proteins, peptides, animal extracts, plant extracts and combinations thereof.

Claim 13 (original): The method according to claim 12 wherein the solution further comprises a second solute material selected from the group consisting of polymers, fillers, disintegrants, binders, solubilizers, excipients, and combinations thereof. In particular, the matrix materials can be, for example, polysaccharides, polyesters, polyethers, polyanhydrides, polyglycolides (PLGA), polylactic acids (PLA), polycaprolactones (PCL), polyethylene glycols (PEG), polypeptides and combinations thereof.

Claim 14 (original): The method according to claim 13 wherein the particles have an average particle size of less than 10 micron and more than 300 nm.

Claim 15 (original): A method of producing particles using supercritical fluid (SCF) comprising:

- providing a source of SCF;

- dissolving at least one solute material and at least one growth retardant compound in the SCF to form an SCF solution, wherein the growth retardant compound includes at least one functional group or portion that is SCF-philic and at least one functional group or portion that is SCF-phobic or solute material-philic; and
- expanding SCF solution across a pressure drop below the critical pressure of the SCF whereby the SCF decompresses and causes supersaturation and nucleation of

particles comprising the solute material, said particles having a smaller size and a reduced amount of agglomeration than if no growth retardant compound was present.

Claim 16 (original): The method according to claim 15 wherein the SCF is supercritical carbon dioxide.

Claim 17 (original): The method according to claim 16 wherein the growth retardant compound is selected from the group consisting of sugar acetates, fluorocarbons and block copolymers.

Claim 18 (previously presented): The method according to claim 17 wherein the block copolymer is comprised of polymer blocks selected from the group consisting of polypropylene oxide, poly methacrylic acid (PMMA), poly acrylic acid (PAA), poly vinyl acetate (PVA) and polyethylene oxide (PEO).

Claim 19 (original): The method according to claim 15 wherein the solute material is selected from the group consisting of medicinal agents, biologically active materials, sugars, viral materials, diagnostic aids, nutritional materials, proteins, peptides, animal extracts, plant extracts and combinations thereof.

Claim 20 (original): The method according to claim 19 wherein the solution further comprises a second solute material selected from the group consisting of polymers, fillers, disintegrants, binders, solubilizers, excipients, and combinations thereof. In particular, the matrix materials can be, for example, polysaccharides, polyesters, polyethers, polyanhydrides, polyglycolides (PLGA), polylactic acids (PLA), polycaprolactones (PCL), polyethylene glycols (PEG), polypeptides and combinations thereof.

Claim 21 (original): The method according to claim 20 wherein the particles have an average particle size of less than 10 micron and more than 300 nm.

EVIDENCE APPENDIX

No evidence was submitted by the applicants pursuant to 37 C.F.R. §1.130, 1.131 or 1.132, and no evidence was entered by the Examiner and relied upon by the applicants in this appeal.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.